# *Republic of South Africa*

## EDICT OF GOVERNMENT

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# SANS 10080:2009

Edition 2.2

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# SOUTH AFRICAN NATIONAL STANDARD

## The rodentproofing of buildings

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**Table of changes**

| Change No. | Date | Scope |
|---|---|---|
| Amdt 1 | 1975 | Amended to delete reference to SABS 018 and replace by reference to SABS 0124. |
| Amdt 2 | 2009 | Amended to change the designation of SABS standards to SANS standards, and to remove reference to South Africa in relation to the position of a health officer. |

## Forword

This South African standard was approved by National Committee SABS TC 59, *Construction standards*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This document was published in February 2009. This document supersedes SABS 080:1972 (first revision).

A vertical line in the margin shows where the text has been technically modified by amendment No. 2.

## Preface

Rodents are found throughout South Africa in both urban areas and open country. Because of the diseases they can spread (particularly plague and food poisoning) and their destructive habits, rodents are regarded as the enemy of man.

Control of rodents may be divided into measures for:

a) direct extermination (such as trapping, poison baiting, or fumigation);

b) indirect extermination (by denial of access to food and to hiding places (harbourage) where they can breed undisturbed);

c) facilitating rodent control (by, for instance, the method of staking and storing of materials and merchandise).

This code is concerned with the application in buildings of measures to deny rodents access to food (water also where practicable) and harbourage and to deny them entry into the buildings.

A knowledge of the habits and capabilities of rodents will help in the planning of a campaign of extermination, and information on these will be found in appendix B.

Recommended methods of control that have been well tried are described in appendix C, while suggestions for stacking and storing so as to facilitate rodent control will be found in appendix D.

In terms of the Public Health Act, 1919 (Act No. 36 of 1919) the onus rests upon the owners or occupiers of land or buildings to take the necessary steps to render buildings rodentproof and to destroy rodents; the Act empowers local authorities to legislate for the taking of necessary measures. This code is intended to be of use in implementing the provisions of legislations and must not be regarded as replacing any provisions or making compliance with them unnecessary.

It should be noted that before existing buildings are altered or added to, or new buildings erected, plans in compliance with the local by-laws must be submitted to the local authority for approval.

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# The rodentproofing of buildings

## 1 Scope

**1.1** This code of practice deals with the conditioning of building sites and with details of building construction which facilitate the rodentproofing of buildings.

NOTE The titles of standards referred to by number in the specification are given in appendix A.

## 2 Definitions

For the purposes of this code of practice the following definitions shall apply:

**finished ground surface**
the permanent surface of the ground adjoining or under the building as distinct from the ground surface before commencement of building operations

**interspace**
any wholly or partly enclosed space not intended for use by human beings or animals

**masonry**
an assembly of structural units (bonded together) of natural stone, cast stone, brick, concrete, or similar building units

**class A material or construction**
a material or construction which cannot be penetrated by rodents even when gnawable edges are accessible

NOTE The term includes a material or construction which is accepted as class A by the local National Health Officer, and a material or construction which, after being tested in accordance with SANS 5419, is classified as having an A degree of rodentproofness. **Amdt 2**

**class B material or construction**
a material or construction which, after being tested in accordance with SANS 5419, is classified as having a B, C, D, or E degree of rodentproofness

# 3 The site

**3.1** If buildings are to be kept free from rodents, it is necessary to control the site. In any case of doubt the local authority should be consulted as to the methods to be adopted. The following measures are recommended:

a) Feedstuffs, food waste, and refuse should be stored in weather-resistant containers of class A construction, having close-fitting lids or doors.

b) Garden refuse should be buried, composted, or removed at intervals of not more than one week.

c) Junk, rubble, and other waste materials which could afford harbourage should not be allowed to accumulate. Other material should be stacked in such a manner that it provides minimum harbourage for rodents and allows easy access for their control (see appendix D).

d) Poultry houses, aviaries, stables, and places of a similar nature should have floors of class A construction and should be kept clean; manure should be collected daily and only minimum quantities of seed, grain, and forage should be put out at one time.

e) Disused drains, pipes, and ducts should be removed from the site or properly disconnected and sealed, and all cavities, holes, etc. filled in with solid class A material so that no harbourage for rodents remains.

f) Dense vegetation, especially hedges, should be so trimmed that the harbourage is reduced and visibility for control purposes is improved. Creepers and overhanging trees providing means of access to a building (particularly to the windows and roofs) should be trimmed.

g) Dilapidated buildings, rooms, walls, floors, etc. should either be completely removed or restored.

h) No interspaces should be allowed in sheeted fences, and interspaces between buildings should be avoided or should be sealed with class A material.

i) Any opening giving access to excavations, tunnels, disused mineworkings, or similar places which may provide harbourage for rodents should be closed by the installation of corrosion-resistant screens of class A construction or by another satisfactory method.

# 4 New buildings

## 4.1 General

In new buildings it is usually comparatively easy to incorporate rodentproofing at the design and construction stages. Health authorities may require the shell of every building to be completely of class A construction. In the case of domestic buildings the health authorities, after taking into consideration the area and environment, may allow a class B construction.

Any food storage facilities in a building should be of class A construction. Interspaces within the building which could afford harbourage to rodents should be protected, but for this purpose, because rodent attack would not be heavy, class B material may be used. (Materials which are penetrable by rodents can be used in class A constructions provided that they are protected as detailed in this code.)

All interspaces of width or height at least 450 mm should be provided with easy means of access for inspection purposes. External access doors to such interspaces should be of class A materials or be, like internal access doors, of class B materials of which all free edges are protected by class A material. Such doors should be kept closed.

The walls and floors of the building present fewer problems than do the necessary openings in them and the interspaces between the various parts of the building.

## 4.2 Foundation

Foundations cannot be relied upon to prevent entry of rodents to below-floor spaces (see appendix B, B.3.4), but the following should be observed:

a) **Materials.** Materials should be of class A quality, i.e. concrete or masonry should be sufficiently hard. For footings of minimum dimensions for single storey houses, a concrete mix of proportion 1 : 3 : 6, hard burnt brick, or hard stone masonry should be used.

b) **Joints.** Mortar joints thicker than 10 mm should be completely filled with mortar of a mix not weaker than 1 part cement to 6 parts sand; or 1 part cement to 1 part lime and 6 parts sand.

c) **Width and depth of foundation footings.** Because it is not practicable to construct foundations wide enough and deep enough to completely prevent the access of rodents to below-floor spaces by burrowing, access (for inspection purposes) to below-floor spaces should be provided by means of access doors (see 4.1) and by making the under-side of the floor at least 450 mm above ground level at all points.

## 4.3 External walls

### 4.3.1 Inherently class A walls

A wall of brick, stone, solid concrete blocks, or cast-in-situ concrete may be considered to be of class A quality when the thicknesses and details of joints are as shown in figure 1 and they, and the proportions of mortar or of mix, are as follows:

a) a wall at least 110 mm thick of hard burnt bricks with a minimum crushing strength of 14 MPa or of weaker bricks which have been proved by test to provide a class A construction with no joints wider than 10 mm, or two joints wider than 10 mm completely filled with mortar of a mix not weaker than 1 part cement to 6 parts sand; or 1 part cement to 1 part lime and 6 parts sand; or with a mortar of weaker mix which has been shown by test to provide a class A construction;

b) a wall of concrete blocks of nominal thickness at least 100 mm and with a minimum crushing strength of 7 MPa, or of weaker blocks which have been shown by test to provide a class A construction;

c) a concrete wall at least 100 mm thick of a mix not weaker than 1 : 2 : 4, or a concrete wall at least 150 mm thick of a mix not weaker than 1 : 3 : 6, or a concrete wall of thickness and of mix proved by test to be a class A construction.

Walls made of materials (other than the masonry materials discussed) that have been proved to be of class A quality need no protection other than at the joints between the units or sheets and at openings.

### 4.3.2 Other walls

Walls of materials that are known or proved by test to be not rodentproof should have a class A membrane incorporated in their thickness as shown in figure 2. If they are of hollow construction, walls should be so protected on all sides of the cavities as to deny rodents access to this harbourage. The membrane should be sufficiently close-fitting to ensure that no harbourage occurs between the class A membrane and the wall covering on the interior or the exterior surface of the wall. The extent of the protection required will depend on the circumstances. If the wall surfaces are smooth and cannot be climbed by rodents and if there is no stacked material, shelving, or other

object on which rodents can climb, within 450 mm of the surface of the wall (see appendix D), the membrane need only extend to 225 mm above the level of the floor, skirting board, or other feature on which a rodent could stand. Where there is shelving or stacked material within 450 mm of the wall or where there are other means of access to higher parts of the wall, the membrane should extend to 225 mm above the top of such features and to 225 mm beyond the end of a shelf or similar feature which does not extend for the full length of the wall. Remember that temporary features (such as clothing hanging against a wall) may provide access for rodents. The whole area of walls whose surfaces can be climbed by rodents needs protection. The lower edge of the membrane should in all cases be secured against the top of the foundation wall or beam by being turned in under the outer or the inner face of the wall or under the wall plate.

Where door, window, or vent openings occur in the wall, the protective material should be closely fitted to door or window frames.

Where the ends of beams or trusses penetrate cavity walls and the openings are not closed by walling, they should be protected by class A material. These measures are illustrated in figures 1 and 3.

### 4.3.3 Beam-filling

Beam-filling should be done as illustrated in figures 1 and 3. Wire netting should be so embedded in the mortar on top of the beam-filling as to reinforce it and prevent pieces of mortar from breaking off. The mortar should not be weaker than a 1 cement : 1 lime : 6 sand mix.

### 4.3.4 Protection against physical damage

In a building in or around which hand trucks or powered vehicles are used, external walls of sheeted construction should be protected against physical damage resulting from the impact of moving objects. This can be done (as illustrated in figure 4) by building the sheeted wall on a substantial solid masonry or reinforced concrete wall 225 mm high above ground level or floor level (higher where necessary) and at least 225 mm thick if only light barrows are used, and at least 350 mm thick if heavy hand trucks or powered vehicles are used. External protection may also be provided by means of flowerbeds, kerbing, or rails.

## 4.4 Internal walls, partitions, and skirtings

### 4.4.1 Internal walls

The impacts to which light internal walls of buildings of the warehouse, workshop, or factory class are likely to be subjected should be considered when deciding on the material and type of construction to be used. The proposed construction should be tested to ensure that it is capable of withstanding the probable maximum impact; otherwise it will not retain its class A quality in use. Permanent guard-rails or similar protection may have to be provided at those points where mechanical damage is most likely to occur.

a) **Solid walls.** Solid internal walls need no protection except where they enclose spaces in which food is stored, prepared, eaten, or sold, in which case they should be built as described for external walls in 4.3.1.

b) **Hollow walls and walls constructed of hollow units.** Where hollow walls and walls built with hollow or perforated units are constructed of class A or class B material they need no protection except at joints between the units and at joints with floors, ceilings, and adjacent walls. Care should be taken that the units are not damaged and that joints and exposed cavities are treated as described in 4.3. Where hollow walls and walls of hollow units are constructed of material that is not of class A or class B quality they should be protected as described in 4.3.2.

### 4.4.2 Partitions and panelling

a) **Partitions.** Internal partitions used to subdivide a rodentproof space need not be of class A or class B construction provided that they do not offer harbourage for rodents. The use of close-fitting single panels and exposed framing is suggested. Where exposure of the framing is not desired and where interspaces are formed between panels of material which is not of class B quality, the partitions should be treated as described in 4.3.2.

b) **Panelling.** Where panelling is used as part of the wall construction (e.g. as insulation or decoration) it should be treated as part of the wall and should be protected as detailed in 4.3.2.

### 4.4.3 Skirtings

a) **Hollow skirtings.** All hollow skirtings, irrespective of the quality or type of the floor or wall, should be constructed of class A material, should be tight-fitting at floor and wall, partition, or panelling surface, and should present no opening with a dimension in excess of 10 mm.

b) **Solid skirtings.** Solid skirtings that have a closed joint at their junction with floor and wall and of which the sectional shape is such that no cavity of depth in excess of 10 mm is formed, need not be constructed of class A or class B material.

## 4.5 Roofs

### 4.5.1 General

It may in general be assumed that all conventional roofings, except thatch, are of class A quality. Although shingles are not inherently of class A quality, no shingle roof has been known to give trouble. Thatched roofs are likely to provide harbourage for rodents but they should not be rendered class A by means of wire netting because of the fire-hazard entailed. Lightning may cause a high voltage surge to travel along the netting, resulting in sparking within the roofing material at any point near an earthed conductor, and so start a fire.

The important points are good workmanship and proper maintenance to ensure that the roofs have no gap of width greater than 10 mm and that no breaks that will afford entry to rodents occur in the covering. It is also important to ensure that no access is provided to roofs by overhanging branches.

### 4.5.2 Ridging and flashing

Tiled roofs should have hip and ridge tiles bedded and jointed in class A mortar. Special care should be taken to fill all openings at the edges of valleys where tiles have been cut, or to turn up the edges of the valley gutter and to flash effectively with soakers, or to apply corrosion-resistant class A netting at the sides of the valley.

Galvanized corrugated steel, aluminium, and asbestos-cement roofs should have the edges of their ridging and flashings so dressed down into the corrugations as to leave no gap of width in excess of 10 mm. Care should be taken to afford no entry at the ends of the ridging. It is good practice to scribe or caulk ridging to roofing, and to protect the entrance to the interior of ridges above gable walls with a packing of wire mesh. All voluminous mortar fillings should be reinforced with wire mesh to prevent cracking and disintegration.

### 4.5.3 Eaves

Closed eaves should be closed with class A material, and no openings should be left with a dimension in excess of 10 mm (see figures 2 and 5). Where eaves soffits are closed with close boarding, no additional measures need be taken, but where a certain amount of ventilation through

the eaves into the roof space is required and where perforated boarding or slats are used, they should be closely backed by a protective screen of corrosion-resistant class A material, spanning from the wall to the underside of the roof covering at the top of the fascia and leaving no harbourage between the boarding or slats and the screening. The soffits of enclosed roof projections at gable ends should be treated similarly.

### 4.5.4 Vents to roofspaces

Where ventilation openings in roofs, eaves, or parapets have openings of width exceeding 10 mm, they should be permanently protected with corrosion-resistant class A netting.

## 4.6 Floors

### 4.6.1 Basement and ground floors

The basement floor (or the ground floor when there is no basement) should preferably be constructed of concrete at least 75 mm thick or of other solid class A material with no joints exceeding 10 mm in width in the floor itself or between the floor and the walls or columns. There should be no interspace between a solid floor and any material, other than class A or protected material, superimposed on it.

### 4.6.2 Upper floors

Where there is a ceiling below a timber floor, the floor may be made a class A construction by the addition of a class A netting screen, placed immediately below the floor boards and securely fastened to the top of the floor joists. This screen should be bent up at the walls and secured behind skirting boards, or lapped and seamed with similar screening where such is provided in the walls above.

## 4.7 Ceilings

### 4.7.1 Ceilings beyond the reach of rodents

No protective measures need be taken where there is no access (see 4.7.2) for rodents to ceilings even when they are constructed of material that is not class A or class B material.

### 4.7.2 Ceilings liable to attack by rodents

Where access for rodents to the ceiling is provided by materials stacked up to a height of within 225 mm of the ceiling, or by shelving or any other feature which provides a foothold within such a distance, the ceiling should either

a) be constructed of class A material, or

b) be permanently protected by a continuous membrane of corrosion-resistant class A material so built into the ceiling as to leave no interspace between itself and the ceiling boards, and secured at the intersection with the walls behind the ceiling cornice or lapped and seamed with a similar membrane where this is provided in the walls.

## 4.8 Doors

External doors and frames in buildings of the warehouse, factory, and workshop class should be constructed of class A material. If they are not so constructed, and in buildings of other classes, external doors and frames should be protected to a height of at least 225 mm above the floor by a covering of suitable class A material. This material should be turned round the edges of frames and

into the rebate. The necessity of protecting wooden doors will depend on the length of time they may be left closed without attention.

Where the appearance of the door is important (as in domestic or business buildings) it should be possible for manufacturers to embody class A sheeting or netting to the required height within the thickness of a flush-type door; solid doors may be protected by making the bottom rail up in two thicknesses with the protective membrane in between. All doors should be close-fitting. The thresholds of doors should be constructed of concrete or other hard-wearing corrosion-resistant class A material and should extend not less than 150 mm outwards from the door face. The width of the gap between the bottom of the door and the threshold of floor should not exceed 10 mm. All doors, whether hinged, sliding, folding, or of another type, should not, when closed, offer a passage wider than 10 mm. To ensure that there is no gap wider than 10 mm past any part of a sliding door, the following construction details (shown in figure 6) may be applied:

a) An adjustable flange fitted to the top of the door to reduce the gap between door and lintel after the hanging of the door.

b) A distance-piece attached to the wall, allowing the door to be hung further away from the wall and so preventing the door from fouling any projection on the wall surface, plus an adjustable flange attached to the side of the door stile to reduce the gap between the distance-piece and the door after the door has been hung.

c) A continuous guide-strip running in the floor track and closing the gap between the bottom rail of the door and the floor.

Where railway tracks are carried through a door opening, it is very difficult to effect a joint of class A construction. No general method can be recommended at present, but the one shown in figure 8 is suggested. The top of the concrete filling between the rail and check-rail must be approximately 40 mm below the tops of the rail heads. The length of the filling in the track should be at least 450 mm.

## 4.9 Windows and ventilation openings

### 4.9.1 Windows

Windows, window frames, and mullions in buildings of the warehouse, factory, and workshop class should be constructed of class A material and should be close-fitting. Window-sills should be constructed of weather-resistant class A material such as masonry, concrete, baked tiles, slate, or corrosion-resistant metal.

### 4.9.2 Ventilation openings

a) **Ventilation shafts.** Ventilation shafts should be made into a class A construction at the place of emergence into the open by the use of suitable flashing, pinned and jointed into the masonry or tightly clamped around the outer surface of the shaft so as to leave no opening of width larger than 10 mm into the internal space. In addition the vent stack opening should be protected by

1) a continuous corrosion-resistant class A sheet-metal barrier placed not less than 1 metre above the highest point of emergence of the shaft, and so constructed that a foothold or passage is denied to the rodents (see also figure 7), or

2) a corrosion-resistant class A wire mesh screen or cage that encases the opening. (The nominal aperture size of the mesh should not exceed 10 mm.)

b) **Other openings.** All other ventilation openings (such as permanent openings, ducts, chases, grilles, openings for fans and for air-conditioning) and windows with external burglar bars, the lower part or the sill of which occurs at a height of less than 1 metre above any finished ground level, roof, balcony, or outside stair, should be screened with durable class A material in such a way that the largest dimension of any opening does not exceed 10 mm (illustrated in figures 1, 2, 3, and 5).

## 4.10 Special openings

Special openings for chutes, conveyor belts, lifts, escalators, and other transport installations used to move persons, goods, or materials to a space which is required to be of class A construction should receive special attention. Where possible, the receiving end(s) and terminal(s) of such installations should be situated in a lobby, separated from the class A-rated space by means of doors of class A construction.

Where this is not practicable, the following protective measures are suggested:

a) Chutes should be covered with and constructed of class A material and all openings in them should be provided with close-fitting access doors or lids (of solid or perforated type) of class A construction. Openings for chutes in floors, walls, and ceilings should be treated as described for pipes and cables in 4.11.

b) The lower parts of escalators and conveyor belts should be completely enclosed in class A screening or boxing. This enclosure should be continuous up to the sides of the moving steps or belt, and the sum of the widths of gaps between the sides of the steps or belt and the enclosure should not exceed 10 mm. The widths of any hole or gap in the moving surface of the escalator or conveyor belt that gives access to the space below, and of the gap between the escalator or belt and its enclosure at the start or at the return end should not exceed 10 mm. When the escalator or conveyor belt is not in operation, the opening in the wall, affording entry for the escalator or conveyor belt, should if practicable be screened by a class A construction consisting of close-fitting doors, removable panels, or guards that extend around the escalator or belt.

c) All lift shafts abutting on areas required to be of class A rating should be of class A construction. Where the lifts used are of a type which requires the openings at landings to be safeguarded, these openings should be fitted with close-fitting doors of class A construction that present no gap wider than 10 mm which provides access to the lift shaft. Where the lifts used are of a type which allows the openings to the lift shaft to remain unguarded, the openings should, when the lift installation is not in use, be protected with close-fitting doors or panels of class A construction.

## 4.11 Openings for pipes and cables

Any roof (except a thatched roof), floor, ceiling, wall, or partition that must be perforated to allow the passage of a pipe or cable should be protected in one of the following ways:

a) By lining the perforation with a corrosion-resistant class A metal sleeve of an internal dimension which exceeds the outside dimension of the pipe or cable by not more than 10 mm. Where the member perforated is not made of class A material, the sleeve should be fitted with a flange fastened flush to the face of the member and extending not less than 40 mm in all directions from the sleeve. All cavities around the sleeve and behind the flange should be filled with solid class A material.

b) By fitting a flat plate with a hole to receive the pipe or cable. The plate should project at least 40 mm on all sides of the hole and should be fixed in position to the face of the member pierced. The hole in the plate should exceed the diameter of the pipe or cable by not more than 10 mm.

c) By plugging openings, where a number of pipes or cables pass through one hole or duct in a wall, floor, or ceiling of class A or class B material, the openings between the pipes or cables at the face penetrated should be plugged with corrosion resistant class A wire netting, compressed to form a pliable filler. This should be pressed in as deeply as possible between the service components, leaving no opening with a dimension in excess of 5 mm. This method is elastic in construction and will allow removals or replacements to be made without requiring expensive repairs to the class A construction. Care should be taken to allow sufficient play between service parts and the duct to fit plugging and to replace any plugging removed after alterations and to ensure that the filling complies with the requirements of this subsection at all times. Where the length of the duct or thickness of the member perforated is substantial, filling should be applied from both sides in order not to provide harbourage on the off side. Where such groups of services penetrate a member that is constructed of materials not inherently of class A quality but that has been made into a class A material by the use of an internal membrane, a class A sleeve or duct should be provided.

   The ends of this duct should be fitted with flanges fixed to the faces of the member as described above. The internal protective membrane(s) should overlap the flanges of the multiple-service duct.

### 4.12 Pier and cable barriers

The upper ends of all ventilation pipes should be fitted with corrosion-resistant class A dome-shaped gratings or cages that allow a passage of maximum width 10 mm. Travel along the outside of the pipes and cables which may afford a means of entry for rodents should be prevented by suitably designed and positioned corrosion-resistant class A sheet-metal barriers. Figure 7 illustrates various types of barriers.

### 4.13 Drains and waste pipes

The outer ends of waste pipes and openings in external walls through which internal drainage channels discharge should be protected by a class A screen or grid.

## 5 Furniture, fittings, and built-in cupboards

**5.1** All movable or fixed fittings, such as counters, cupboards, and storage units (especially in buildings of the store, warehouse, or factory class) should be constructed in accordance with the following principles:

a) They should preferably be constructed without interspaces.

b) If the unit is constructed entirely of class A material, closed interspaces may be allowed.

c) If the unit is constructed of material that is not of class A quality, any unavoidable interspaces should be protected with class A material.

d) Doors and drawers in cupboards, counters, and other storage units should be close-fitting.

## 6 Rodentproofing and maintenance of existing buildings

**6.1** The protective measures recommended in this code should be regularly checked and properly maintained at all times. Special attention should be paid to points where wear can increase the clearance between doors and thresholds, or where weathering or damage to finishes could provide access.

When rodentproofing of existing buildings is undertaken and particularly that of finishes and fittings (which are the most likely places to be attacked), the degree of rodent attack and infestation found will indicate the urgency of each protective measure to be introduced. If the infestation is not quickly eliminated, it is strongly recommended that the local Health Department should be consulted without delay.

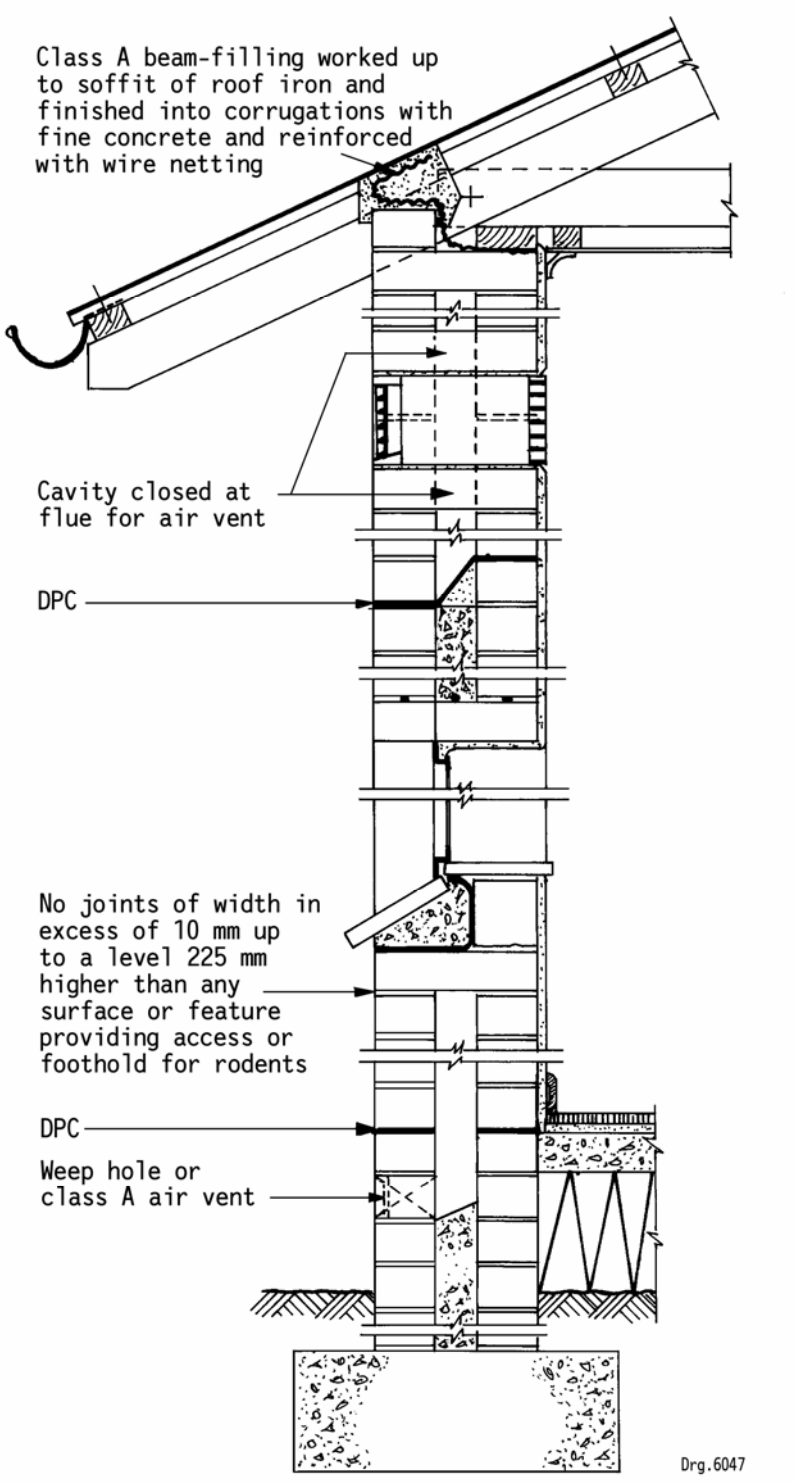


**Figure 1 — Rodentproofing of cavity wall under sheeted roof**

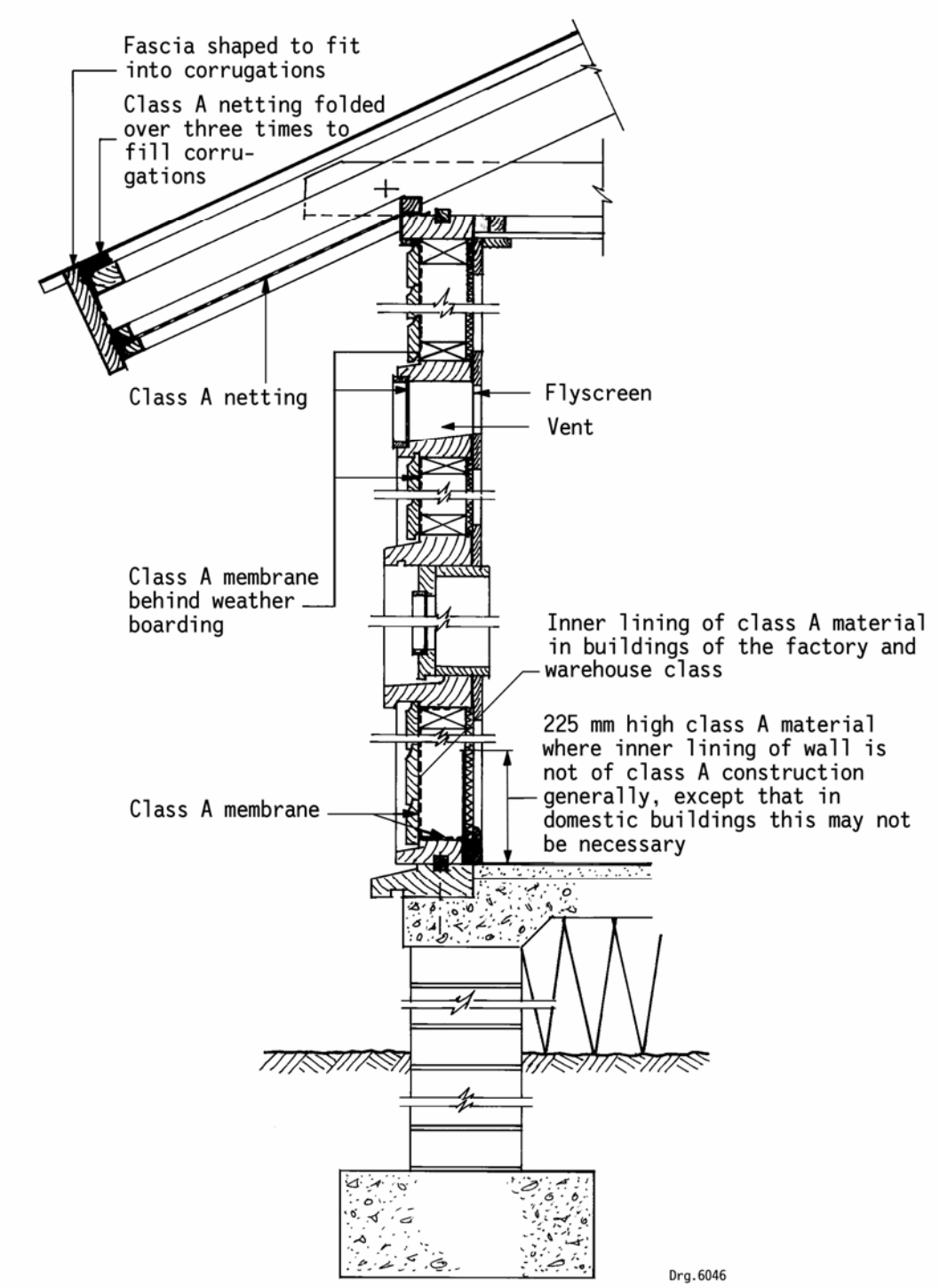


**Figure 2 — Rodentproofing of boarded or sheeted wall under screened eaves**

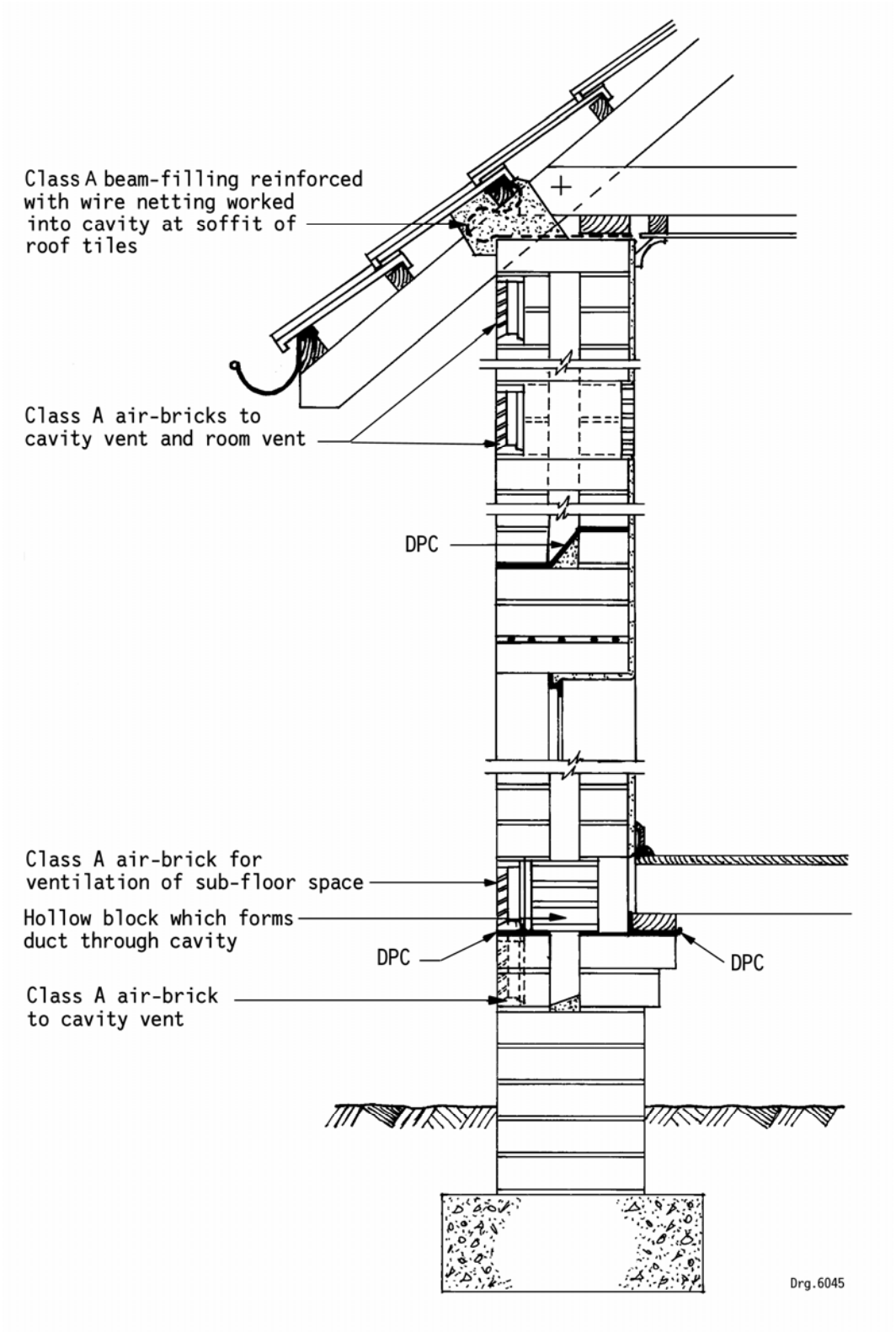


**Figure 3 — Rodentproofing of cavity wall under tiled roof**

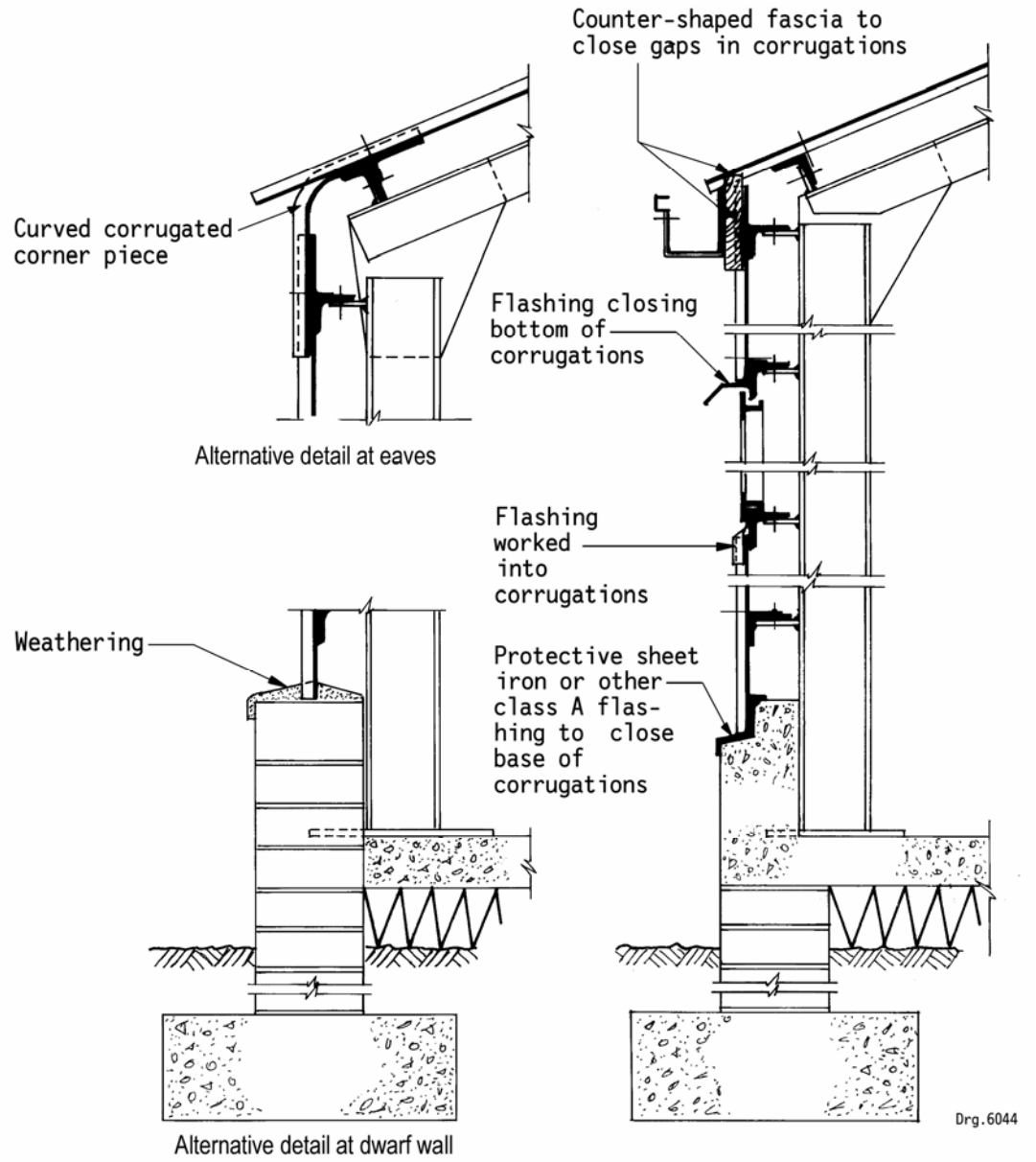


**Figure 4 — Rodentproofing of sheeted walls in commercial buildings**

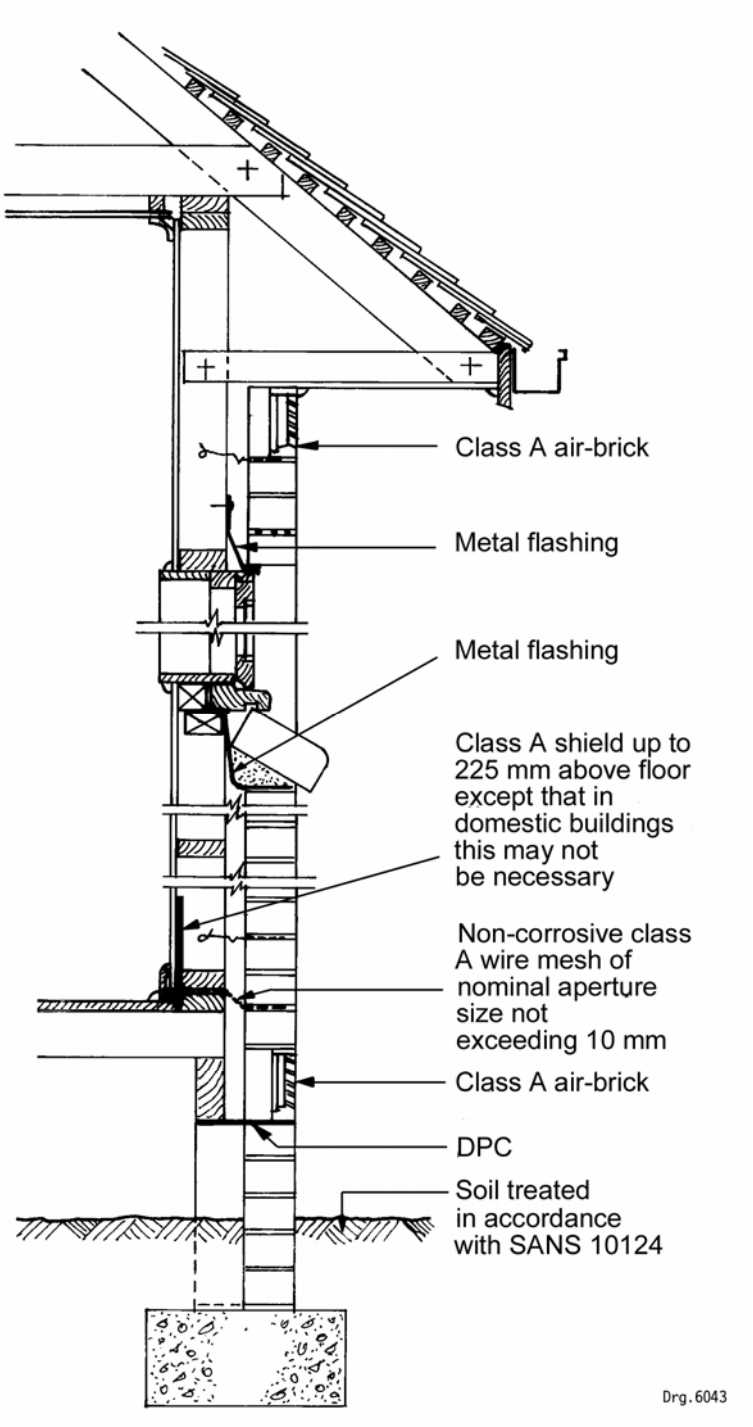


**Figure 5 — Rodentproofing of lined external wall under boarded eaves**

**Amdt 1**

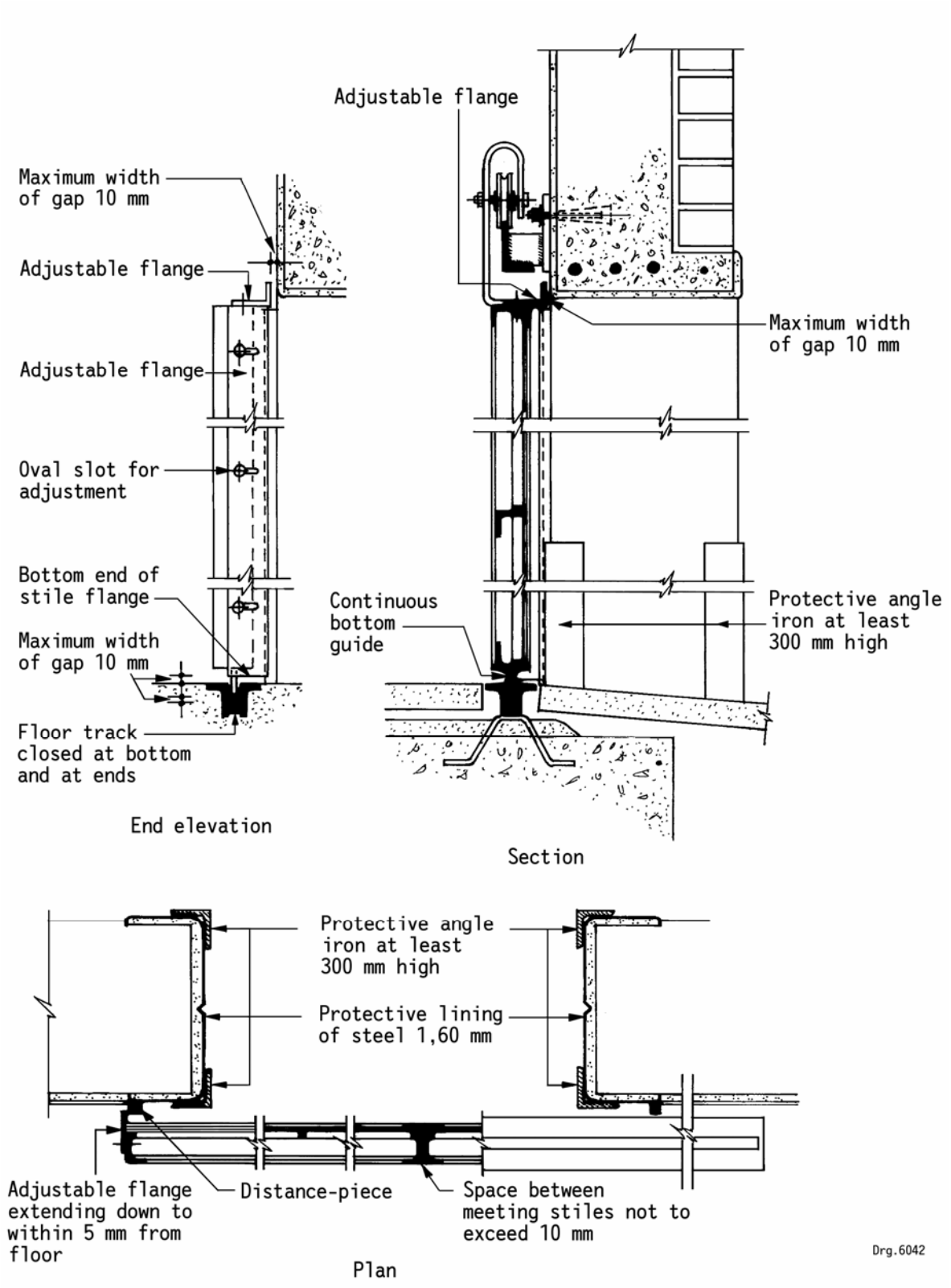


**Figure 6 — Rodentproofing of sliding door**

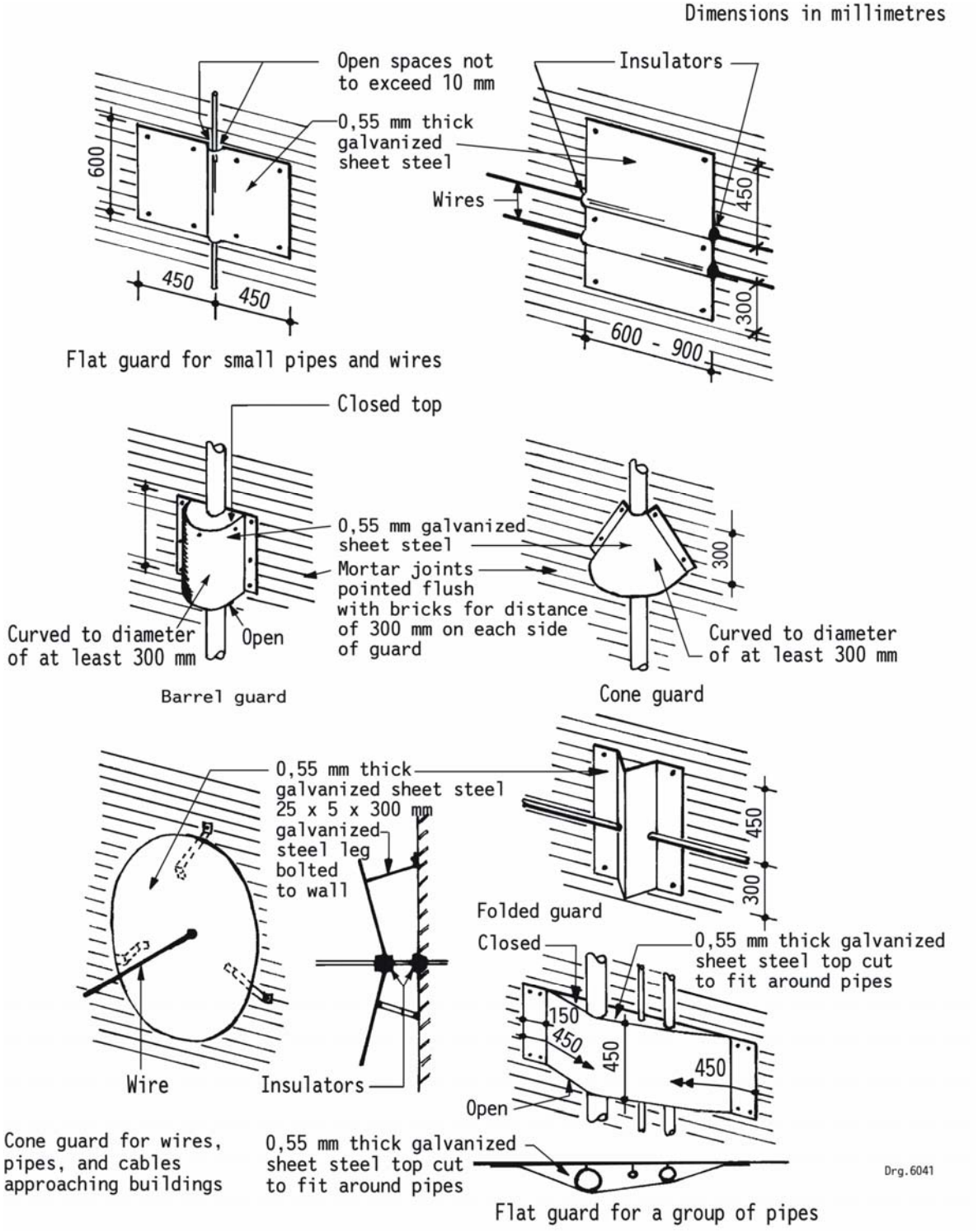


**Figure 7 — Rodentproof barriers**

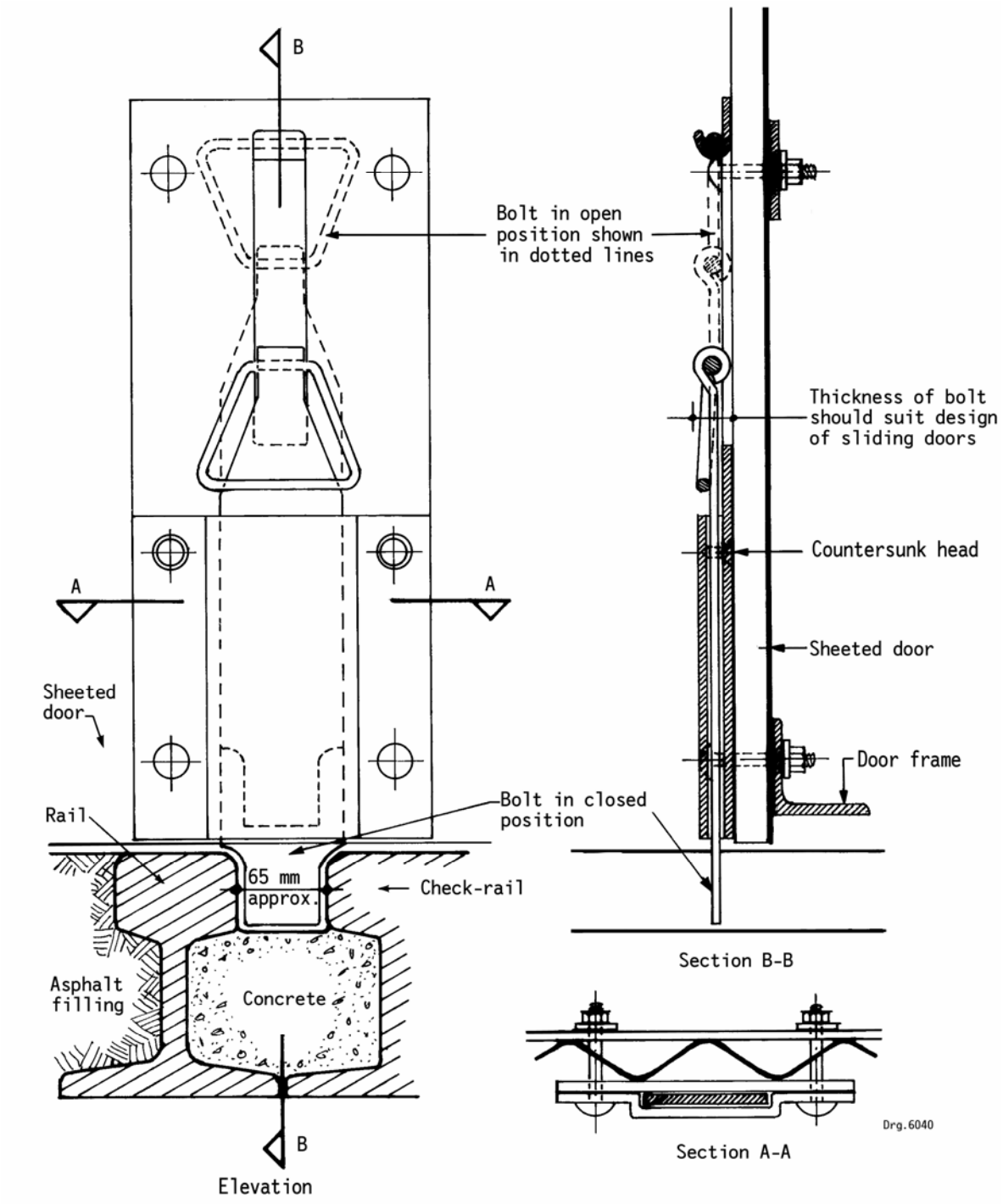


**Figure 8 — Rodentfroofing of door over railway track**

# Appendix A

# Applicable standards

Reference is made to the latest issues of the following standards:

~~SABS 018, *The application of petachlarophenol solution as a soil poisoner.*~~ **Amdt 1**

SANS 5419 (SABS SM 419), *Evaluation of rodentproofness of building materials and constructions.*

SANS 10124, *The application of soil insecticides for the protection of buildings.* **Amdt 1**

# Appendix B

# Information on rodents found in South Africa: their habits and capabilities

## B.1 Identification of rodents

### B.1.1 General

In the rodentproofing of buildings in South Africa we are primarily concerned with the following three domestic and one semi-domestic species of rodent:

a) the house rat, *Rattus rattus* (L);

b) the brown rat, *Rattus norvegicus* (Berkenhout);

c) the house mouse, *Mus musculus* (L); and

d) the semi-domestic species, the multimammate mouse, *Praomys natalensis* (A. Smith).

These rodents are a menace to our health, to our food supplies, and to our economy.

### B.1.2 The house rat

*Rattus rattus* is commonly known as the house rat, but is also known as the black rat, grey rat, roof rat, or ship rat. This species is distributed over the whole of Southern Africa except the drier parts of the Karoo and the Kalahari. It lives in close proximity to man in buildings, harbouring under floors, in ceilings, under roofs, behind matchboard linings, in cavity walls, on wall plates, in dry-packed stone walls, rubbish heaps, stacked grain, or any place which affords shelter or protection in close proximity to available food supplies and drinking water. It may also nest underground. It is a good climber, can run up rough corners of vertical walls, up pipes, and along telephone wires, cables, and ship mooring ropes. Black smears can usually be seen on hard surfaces along its runways. It multiplies very rapidly, breeding all the year round. The female has up to ten young in a litter and five to eight litters a year. The house rat is suspicious, reacting to any change in its surroundings.

### B.1.3 The brown rat

*Rattus norvegicus* is commonly known as the brown rat but also as the Norway or sewer rat. It is found in and near seaports and is unknown in places some distance from the sea. It lives in colonies varying in number from a few to many hundreds, depending upon the amount of food and shelter available. Although it has the ability to climb, it is essentially a burrowing rodent. It harbours in piles of stone or burrows in the ground, under foundations, or under grain stacks. Under favourable conditions it multiplies rapidly having four to ten young in one litter and four to eight litters in a year, the breeding commencing when the rats are three or four months old. It is a nocturnal rodent and is seen in daylight only when disturbed. It follows regular routes between harbourages and feeding places, its run being indicated, on hard surfaces, by black smears. In the open, runways are seen in long grass and other vegetation as tunnels. Brown rats are suspicious and avoid strange objects placed in their runs, even though these objects may be edible; it takes them several days to overcome their suspicion.

### B.1.4 House mouse

*Mus musculus*, the house mouse, occurs throughout Southern Africa and there is hardly a farm building or hut where it is not to be found. It usually lives in close proximity to man, but it can adapt itself to other conditions as long as there is food and shelter. It lives in cupboards and wardrobes, in burrows, haystacks, grain stacks, and rubbish heaps or in any place where it can find food and shelter. Under favourable conditions, it breeds rapidly, from four to ten young being produced in one litter and the female breeding up to ten times a year. It is a nocturnal rodent but is known to feed during the day. Its range of movement is more restricted than that of the domestic rat; it normally moves only between harbourages and feeding places. It does not show any reaction to strange objects.

### B.1.5 Multimammate mouse

*Praomys natalensis*, the multimammate mouse, is a wild rodent, but it has become domesticated or semi-domesticated in parts of the country and is distributed over the whole of Southern Africa except the Karoo and the South-Western Cape areas. It is to be found in or near cultivated fields and often in buildings. When conditions are favourable, it multiplies extremely rapidly, living in colonies of a hundred and upwards. The female has a large number of mammae and as many as 18 young may be produced in a single litter every 4 or 5 weeks.

## B.2 The habits of rodents

### B.2.1 Behaviour and movements

Rodent behaviour is influenced by several factors, including maternal protective instinct, hunger, thirst, sex, and curiosity.

When rodents are denied food their efforts to find food increase for 2 or 3 days before declining at the onset of weakness. Efforts to quench thirst reach their peak within 24 to 48 hours and are followed by a rapid decline at the onset of weakness.

A rat kept in isolation without food or water dies within 7 days, but because one rat will eat another, extermination of rats by cutting off food supplies will take longer than 7 days. The average length of life of a rat is probably less than a year.

The rat's sense of touch is highly developed and depends in part on the nose, the vibrissae, and the tactile hair of the body.

A rat prefers a passage narrow enough to permit its vibrissae to touch both sides to a runway with one side open, and would rather maintain contact with a wall on one side than travel across open areas where there is exposure on both sides. Rodents travelling inside a building follow the same routes repeatedly.

### B.2.2 Food

Rodents will eat practically anything. Adult rats require 20 g to 30 g of dry food and 30 ml to 40 ml of water in a 24 hour period. Mice need considerably less. Rodents develop regular habits in eating, and variations are governed largely by the amount and kind of food available and by the environment. Food is generally carried back to the harbourage before it is eaten. Rats eat eggs and attack small live animals.

### B.2.3 Period of activity

Rodents are most active during the period beginning at sunset and ending at sunrise, but hunger and fear will drive them to daytime activity. Under very favourable conditions they will move about freely at any time of the day.

### B.2.4 Nesting places and harbourages

Concealed and protected places are used as harbourage not only for nesting, but also for retreat from natural enemies (when rats are found away from the nesting area) and for eating in safety. Underground burrows for nesting or harbourage do not usually exceed 450 mm in depth.

### B.2.5 Gnawing habits

Rodents gnaw their way into buildings and through obstructions they encounter in the interior of the building. A rat usually gnaws only when it can sit on its haunches to do so. They must gnaw every day of their lives to keep their incisors (which grow rapidly throughout life) short enough for effective use. The average growth amounts to 115 mm per year in upper incisors, and 140 mm per year in lower incisors.

## B.3 The capabilities of rodents

### B.3.1 Gnawing abilities

It is believed that rodents will gnaw any material that has a gnawable edge with a degree of hardness less than that of the enamel on their teeth. Rats will gnaw through lead pipes.

### B.3.2 Swimming ability

A rat can swim from the age of about 8 days. Rats swim strongly and rapidly and have in open water been observed to swim as much as 800 m. Reports indicate that the brown rat can penetrate the water seal in water closets and in the open sumps of floor drains.

### B.3.3 Reaching and jumping ability

Rats are able to gauge accurately the effort required for varying jumps, and, even up smooth vertical walls, can reach almost as far as their own length, i.e. a maximum of 450 mm.

A rat can jump nearly 600 mm high from a standing start. With a running start and with a trick of gaining momentum by bouncing against any vertical surface, it can jump to a height of 1 metre. Jumping forward and down, a rat can, from a standing start cover a horizontal distance of 2,5 m while dropping less than 4,5 m. With a running start it can traverse an even greater distance. A rat can fall two or three storeys without injury.

### B.3.4 Burrowing ability

To escape capture or to gain access to food rats will, in exceptional circumstances, burrow 1,2 m or more downwards in firm ground, and up to 1,8 m downwards in loose fill. Rats will tunnel at lesser depths along the full length of walls in search of a possible opening.

# Appendix C

# Recommended well-tried methods of control

## C.1 General

With the latest techniques and with the means at our disposal, complete eradication of rodents within specific areas is possible. The advice of the local Health Authority or of a recognized firm of fumigators and rodent exterminators should be sought. It must be borne in mind that the extermination of rodents is of a temporary nature if it is not accompanied by the rodentproofing of buildings. Rodent extermination methods are uniform, i.e. they are not modified because only one species of rodent is present. Mice will react sooner to the same bait than rats.

## C.2 Determination of the limits and the degree of rodent infestation

### C.2.1 General

Inspections of premises are necessary to determine where rodents are nesting, moving, and feeding. It is important to determine the limits and the degree of infestation, so that the whole rodent population may be destroyed in one operation. It is more expedient to treat a group of premises in one operation than to eradicate the rodents on one site after another. If infestations must be dealt with separately, the treatment of premises should overlap as much as possible to prevent rodents from reinvading premises already cleared.

### C.2.2 The following signs of infestation should be studied to determine the limits and degree of infestation:

a) the presence of droppings;

b) body brush marks and footprints;

c) gnaw marks and damage to merchandise;

d) holes and burrows;

e) runways in grass and other vegetation.

#### C.2.2.1 Droppings

Droppings are to be found close to harbourages and feeding places, and the amount of fresh droppings indicates the degree of infestation. Old droppings should be removed and the sites reinspected on the following day.

#### C.2.2.2 Body brush marks and footprints

Body brush marks and footprints are to be found on dusty floors and shelves, around holes in walls and ceilings, and along rafters, pipes, and cables. A tracking powder (such as talc or flour) dusted over the floor or shelves is useful in determining the movements of rodents.

#### C.2.2.3 Damage

The amount of gnawing and damage to merchandise is also an indication of the number of rodents present.

#### C.2.2.4 Holes

The number of holes in walls, doors, ceilings, floors, and cupboards and the number of burrows in the open will give further indication of the number of rodents. Such openings may be closed with soil or some such material and their re-opening will show which are in use.

#### C.2.2.5 Runways

If distinct runways are formed by rodents, tracks in grass and other vegetation indicate the limits of infestation.

## C.3 Methods of control

### C.3.1 General

Methods of control include

a) poisoning,

b) fumigation,

c) trapping, and

d) flooding of burrows.

### C 3.2 Poisoning

#### C.3.2.1 General

In the past certain highly toxic substances such as phosphorus, arsenic, strychnine, fluorides, zinc phosphide, and "antu" were used in preparations for rodent destruction. They have now been superseded by the more effective and less dangerous anti-coagulant rodenticides. These rodenticides are readily obtainable at very little cost. The substances are marketed ready for use or in concentrated forms to be mixed by the user. They are available in dry and in liquid form.

The active ingredients in these rodenticides are anti-coagulant substances which induce gradual and gentle internal haemorrhage. Rodents do not develop an aversion to these poisons and are not known to build up resistance to them. Anti-coagulants will not give effective control when applied in a single dose; they must be fed to the rodents regularly until death ensues. These slow-acting rodenticides fulfil all the requirements of an ideal poison bait. There is no need for prebaiting; there is no development of bait-shyness; no physical pains are experienced by the rodent; and there is no suspicion on the part of the other rodents of the cause of death.

The poison has no odour or taste and there is no loss of effectiveness under normal conditions. Toxic danger to man and other animals is low in comparison with the highly toxic poisons previously in use.

#### C.3.2.2 Bait preparation

Dry anti-coagulant concentrates should be mixed in accordance with the manufacturer's instructions. Usually this is in the proportion of 1 part by mass of the concentrate to 19 parts by mass of a fresh cereal such as mealie meal, oatmeal, flour, and prepared feeds. Thorough mixing of the poison with the cereal is essential. To prevent loss of attractiveness to rodents through staleness, sufficient bait for a week's supply only should be prepared at a time.

Liquid and water-soluble anti-coagulant concentrates are prepared by mixing or diluting with water in accordance with the manufacturer's instructions. There is no deterioration in these liquid poisons.

### C.3.2.3 Bait containers

a) **The P3 container** (for dry bait) is a small wooden box so shaped that it forms a tunnel when placed against a wall or other vertical surface (see figure C.1). Rodents climb up through the opening under the lid, over the baffle, and into the bait chamber to feed undisturbed. The use of the P3 container overcomes the rodent's instinctive shyness by providing fixed sheltered feeding places. The most important feature of the container is that when placed properly it is specific only to rodents in that the bait is inaccessible to other animals or to birds and children.

b) **Poison-bottle stand.** The stand is a simple arrangement (see figure C.2) to hold a 750 mL bottle over a small dish to provide a constant supply of drinking water. Liquid anti-coagulant poisons have proved to be extremely effective on premises where water is not readily available. For quicker results the use of both dry and liquid anticoagulant baits is advisable.

### C.3.2.4 Selection of bait stations

A thorough inspection of the area to be treated should be made so that a programme can be planned. Bait stations should be sited along runways between nesting, feeding, and drinking places. It may be necessary to improvise shelves or platforms to hold the containers, which should be protected against dampness.

The number of baiting points depends on the extent of the area to be treated, and the quantity of bait in each container depends on the degree of the infestation. It is better to use many containers each holding a normal quantity of bait than to have over-filled containers in one or two places.

### C.3.2.5 Checking baits for large-scale operations

The 1-2-5-10-day programme is recommended. Bait is put out on the first day and inspected the next morning to ascertain the amount of bait consumed; enough bait is added to outlast three days' consumption; the bait is checked on the fifth day and enough is added to last for another five days; on the tenth day, if there is still evidence of feeding, the containers are replenished. While there is evidence of feeding, inspections should be made once a week and containers should be refilled with fresh bait. At the cessation of feeding, containers may be left at vantage points and checked at monthly intervals to detect any re-infestation.

## C.3.3 Fumigation[1)]

### C.3.3.1 Hydrocyanic in powdered form

The use of hydrocyanic acid in powdered form has proved to be a practical method of destroying rodents. The active ingredient of the powder is calcium cyanide, which on exposure to air gives off deadly hydrocyanic acid gas, leaving a residue of harmless slaked lime. A duster pump is used to force the powder into rodent harbourages and the rodents are killed in a few moments. The gas is readily absorbed by liquids and food products containing fats. Foodstuffs (milk, butter, cheese, eggs, and meat in particular) and drinking water should not be exposed to this gas because of its lethal nature. The fumigant should be handled by responsible trained personnel only.

[1)] SANS 10072 gives useful information.

#### C.3.3.2 Carbon monoxide

This gas is economical to use and is very effective when used for the destruction of rodents in burrows. The method of application is to force the gas through the burrow and immediately afterwards to seal the burrow.

A common practice is to generate the gas by running an internal combustion engine (of a motor-car for instance) and to force the gas into the burrow by means of a hose pipe attached to the exhaust pipe of the engine.

This method should not be used in or near buildings because of the danger to an operator working in a confined space and because of the possibility of gas leakage from the burrow into the basement or low-level spaces in the building.

### C.3.4 Trapping

#### C.3.4.1 Powell traps and torpedo traps

When infestation is slight and small-scale destruction is indicated, powell traps and torpedo traps can be effectively employed. The barrels of these cage traps must be completely covered with hessian or similar material, but both ends must be left uncovered to allow rodents to see through the cage. These traps are obtainable commercially.

The traps are placed at selected points along runways and should be baited (but not set) with a supply for 3 or 4 days. Attractive baits (such as pumpkin, lettuce, carrots, mealie meals and oatmeal porridge) should be used to encourage the rodents to enter and feed inside the trap. After a few days the traps are freshly baited and set.

#### C.3.4.2 Break-back traps

These traps are useful in the case of light infestations, but rodents seeing other rodents being caught soon become trap-shy. The traps should be placed in runways or in front of burrows and should be used baited or unbaited.

### C.3.5 Flooding of burrows

Burrows may be flooded to drown rats or to drive them out; they should be clubbed on escaping.

## C.4 Disposal of dead rodents and uneaten baits

**C.4.1** Trapped or poisoned rodents and uneaten baits should be disposed of by incineration or deep burial.

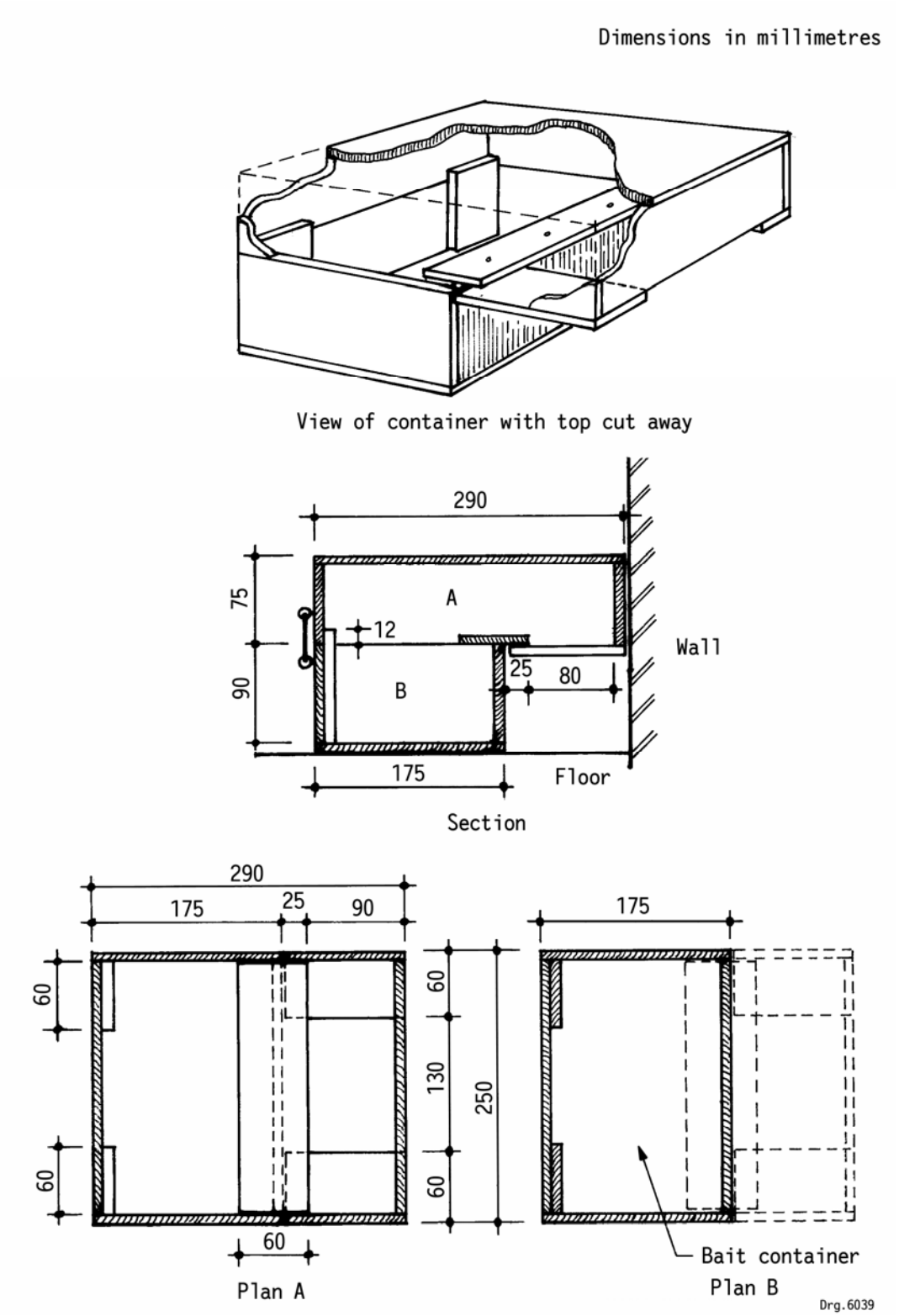


**Figure C.1 – P3 bait container**

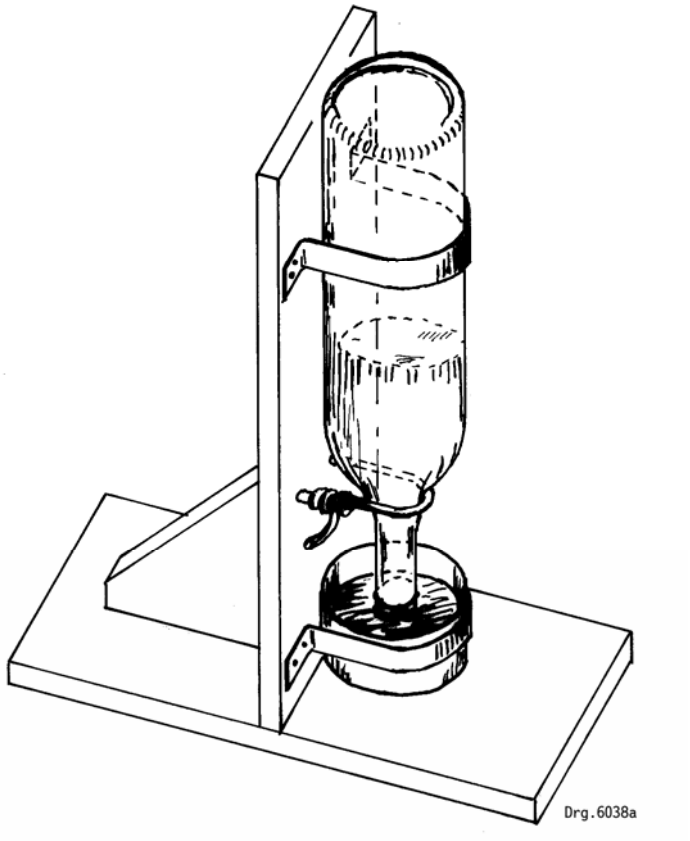


**Figure C.2 (a) — Wooden poison-bottle stand**

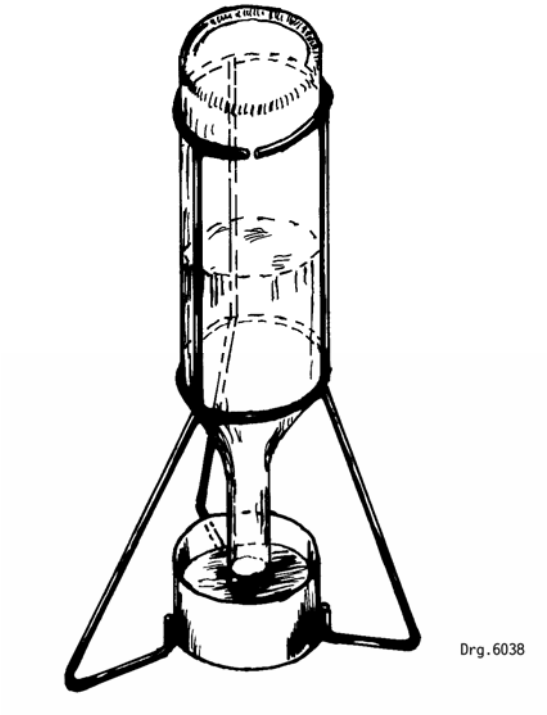


**Figure C.2 (b) — Galvanized wire poison-bottle stand**

**Figure C.2 — Poison-bottle stand**

# Appendix D

## Suggestions for the stacking and storing of merchandise and materials to facilitate rodent control

Materials should be compactly stacked in piles on open racks, the open space below the rack being at least 225 mm high and visible from all sides, so that no harbourage is provided.

Ideally, piles should be composed of single rows of bags, boxes, or cartons, with spaces (of width at least 225 mm) between rows completely open to view from both ends. Double rows provide small spaces which are out of sight and these afford harbourage to rodents. The greater the width of the stacks, the greater is the harbourage created and the more difficult is inspection. When it is not possible to avoid creating such harbourage in a building which is not rodent proofed, it is advisable not to leave the goods undisturbed for longer than one month.

The space between stacked material and a wall should be at least 450 mm wide, not only to allow a free passage for inspection, cleaning, and fumigation, but also to deny rodents access to the upper parts of the wall.

Materials stacked in the open (such as grain in bags or fodder) should be protected from rodents by the provision of a floor of class A construction surmounted by a class A enclosure consisting of corrosion-resistant class A screening and roof. Doors or gates in these enclosures should be close-fitting, no opening having a width exceeding 10 mm.

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